

Unit - II

Open channel flow - II

* Non-uniform flow:-

A non uniform flow is one in which velocity is not constant at a given instant. A flow in which quantity of liquid flowing per second is not constant, is called unsteady flow.

Velocity and pressure within the pipe. Unsteady flow may also include periodic motion such as that of waves or beaches.

Non-uniform flow is divided into types.

(i) Gradually varied flow.

(ii) Rapid varied flow.

* Gradually Varied flow:-

The problem of gradually varied flow is that of predicting overall flow pattern (or) In other words, prediction of the water surface profile to be expected in a given channel with given steady discharge.

* Dynamic equation for gradually varied flow:-

The dynamic equation for GVF can be derived from the basic energy eqn with full assumptions
 a) The uniform flow formulae may be used to evaluate the energy slope gradually.

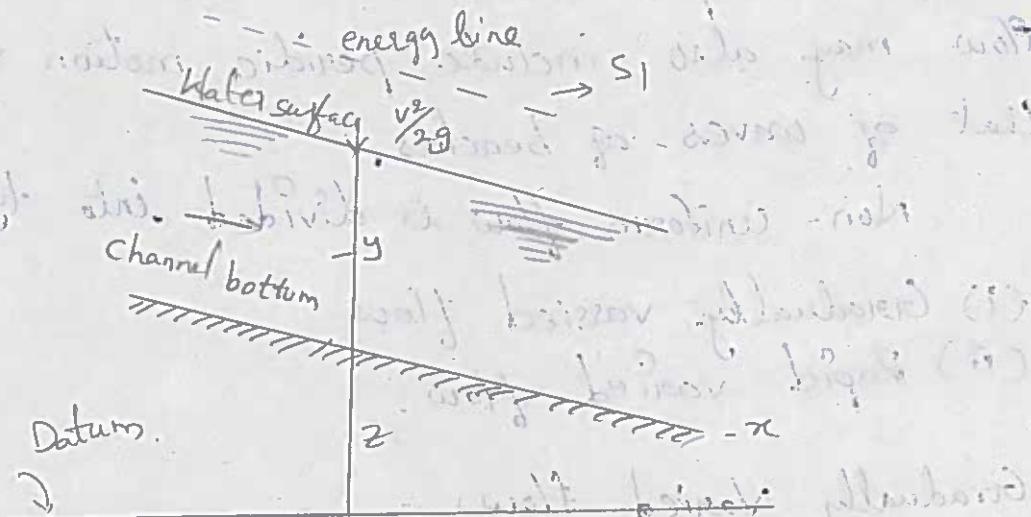
$$(S_f)_{GVF} = \left[\frac{V_n}{R^{2/3}} \right]^2$$

$$(S_f)_{GVF} = \left(\frac{V}{CJR} \right)^2$$

- b > the bottom slope of channel.
 c > the channel is prismatic.
 d > the energy correction factor α is unity.
 e > The pressure distribution in any vertical
 is hydrostatic.

$$H = \frac{V^2}{2g} + y + z$$

$$H = \frac{Q^2}{2gA^2} + y + z$$



Differentiating the equation.

$$\frac{dH}{dx} = \frac{d}{dx} \left(\frac{Q^2}{2gA^2} \right) + \frac{dy}{dx} + \frac{dz}{dx}$$

$$\frac{dH}{dx} = \frac{-Q^2}{gA^3} \frac{dA}{dx} + \frac{dy}{dx} + \frac{dz}{dx}$$

$$\therefore S_f = -\frac{Q^2 T}{gA^3} \frac{dy}{dx} + \frac{dy}{dx} - S_0$$

$$\frac{Q^2 T}{gA^3} = F_r^2$$